Foreword

To obtain the highest performance and the longest service life from your Linear Gage, carefully read this manual thoroughly prior to setup and operation. After reading this manual keep it near the Linear Gage for quick reference. The specifications of this gage and the description in this manual are subject to change without prior notification.

Safety Precautions

To ensure operator safety, use the instrument in conformance with the directions and specifications given in this User's Manual.

NOTE

- If a contact point with a sharp tip is used, exercise sufficient care in handling during replacement or use of it so as not to get hurt.
- If a contact point is released freely after it has been pressed in, the contact point may burst forth at a very high speed depending on the amount of spindle travel. Sufficiently exercise care so that your fingers or hand may not be pinched.

Precautions for Use

Carefully avoid the following attempts and conditions to protect the instrument from failure and malfunction.

IMPORTANT

- Do not apply sudden shocks including a drop or excessive force to the linear gage.
- Do not disassemble or modify the gage.
- Do not use and store the gage at sites where it is exposed to direct sunlight or at extremely hot or cold sites.
- To use the gage highly accurately, avoid sites where the temperature will change abruptly.
- Absolutely do not apply an electric engraver to the gage. The high voltage may damage electronic parts. Also, do not use the gage at sites where it is subject to large electric noises.
- Do not exert load on the spindle in the perpendicular direction and do not twist the spindle.
- Do not clamp the stem too tightly, since the spindle will not move smoothly.
- Do not apply excessive tension to the cable or do not bend it forcibly.
- To perform stable measurement, allow at least 10 minutes after turning on the power.
- Do not set up the origin point at either end of the stroke.
- If the gage is used in combination with other instruments, the maximum performance could not be obtained depending on environmental and operating conditions. Take those conditions into consideration prior to use.
- The functions and performance will not be guaranteed, if the gage is used in other conditions than those specified.
- Tale sufficient damage-preventive processing (safety measures), should this gage have been at fault.
- A contact point could hurt a workpiece depending on the workpiece material, measuring force, impact when the contact point comes in contact with the workpiece, etc. Check that there is no problem of hurts on a workpiece during measurement or accuracy variation depending on the measuring force, etc., in advance of use.

Electromagnetic Compatibility (EMC)

This product complies with the EMC Directive. Note that in environments where electromagnetic interference exceeds EMC requirements defined in this directive, appropriate countermeasures are required to assure the product performance.

Disposal of Old Electrical & Electronic Equipment (Applicable in the European Union and other European countries with separate collection systems)

This symbol on the product or on its packaging indicates that this product shall not be treated as household waste. To reduce the environmental impact of WEEE (Waste Electrical and Electronic Equipment) and minimize the volume of WEEE entering landfills, please reuse and recycle.
For further information, please contact your local dealer or distributors.

Export Control Compliance

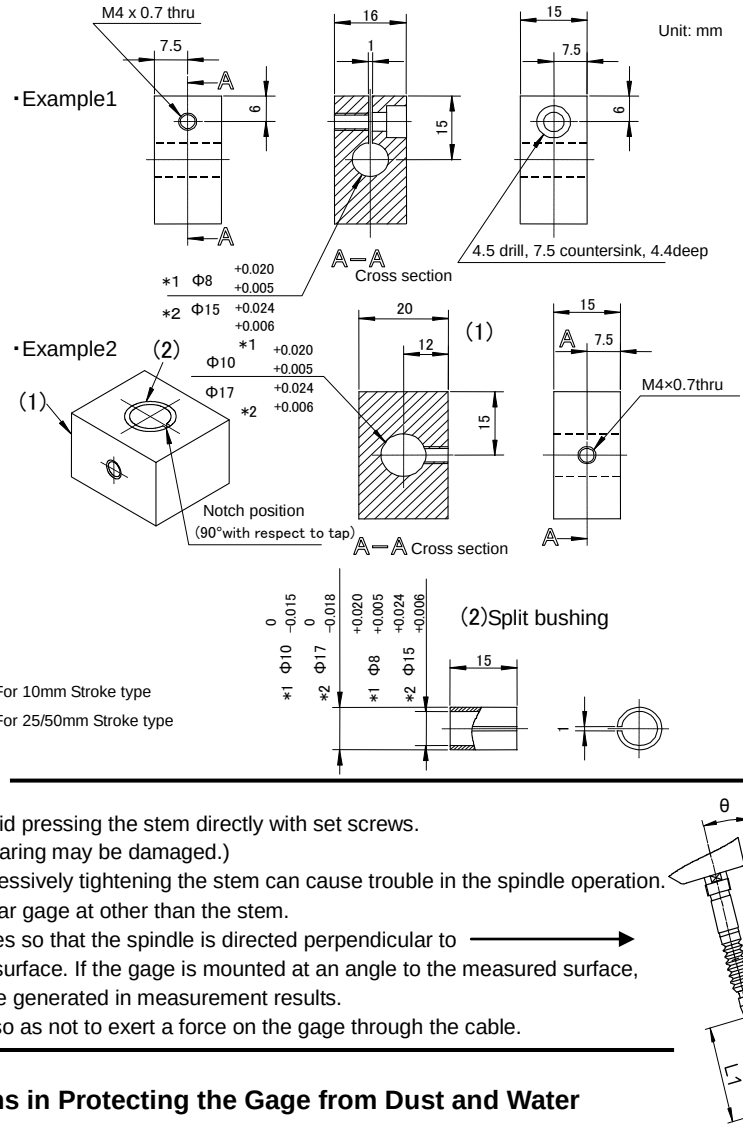
The goods, technologies or software described herein may be subject to National or International, or Japanese Export Controls. To export directly or indirectly such matter without due approval from the appropriate authorities may therefore be a breach of export control regulations and the law.

1. Name and Dimension of Each Part

(1) Stem
(2) Rubber boot
(3) Spindle
(4) Contact point
(5) Output cable
(6) Output connector

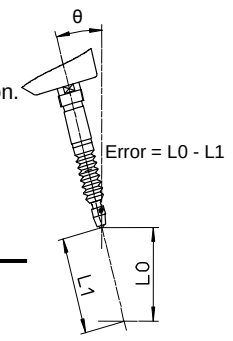
2. Mounting the Gage

To mount the gage on another instrument or a fixture, clamp the Φ8 stem or Φ15 stem.
It is recommended to use a slotted holder or a split bushing for the mount structure.



IMPORTANT

- Absolutely avoid pressing the stem directly with set screws. (The built-in bearing may be damaged.)
- Notice that excessively tightening the stem can cause trouble in the spindle operation.
- Never fix a linear gage at other than the stem.
- Mount the gages so that the spindle is directed perpendicular to the measured surface. If the gage is mounted at an angle to the measured surface, an error may be generated in measurement results.
- Exercise care so as not to exert a force on the gage through the cable.



3. Precautions in Protecting the Gage from Dust and Water

IMPORTANT

- The output connector plug and preamplifier (counter side) is not protective structured. Install the gage at a place where it is not splashed directly with water or oil.
- If an extension cable is used, completely cover the preamplifier and connector area with a seal so as not to be exposed to environments.
- If the cable covering is broken, liquid will penetrate into the gage inside due to capillary phenomenon. This will cause damage to the gage. Immediately repair the cable.
- Be greatly careful not to damage the rubber boot due to chips, etc. If the rubber boot is damaged, dust-proof function will be deteriorated. Immediately replace or repair the rubber boot.
- The materials including rubber which are used for the rubber boot and other sealing parts are not universal against diversified coolants and chemicals. If those parts deteriorate unusually, consult the nearest Mitutoyo Service Center.
- If linear gages are used in adverse environments where they are subject to frequent splashes of water and oil, it is recommended to take preventive measures such as replacing them before being damaged.
- Each part of the gage is sealed up, and therefore must not be disassembled. If any part is disassembled, the rated performance will not be obtained. Do not absolutely disassemble the gage.

4. Connecting the Gage to a Counter

Connect the output connector of the gage to the input connector on a linear gage counter. For detailed information, refer to the user's manual of the linear gage counter.

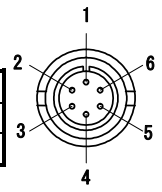
IMPORTANT

- If the gage cable is close to the power line for other instruments, the gage may malfunction. Connect the gage cable as apart from the power line as possible.
- If the gage is connected with other counter than Mitutoyo made, allow at least 0.2 second after the gage is turned on, then reset the counter.

5. Gage Output Signals

1) Output connector: RM12BPE-6PH (Hirose)

2) Pin assignment



Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
1	+5V *3	3	ΦB	5	GND
2	ΦA	4	$\overline{\Phi A}$	6	$\overline{\Phi B}$

*3: Power supply to the gage head
Power voltage; 5V (4.8N to 5.2V),
Ripple voltage: 200mVp-p or less
Current consumption: 120mA max.

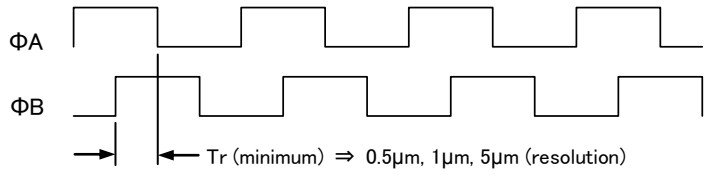
3) Input/output signal level

ΦA, $\overline{\Phi A}$, ΦB, $\overline{\Phi B}$, ΦZ (TTL line driver AM26LS31 or equivalent)

4) Output signal chart

This series of gages are provided with the following three patterns for their output signals. Therefore, always design the reception circuitry so that it includes an error detecting process making use of these patterns:

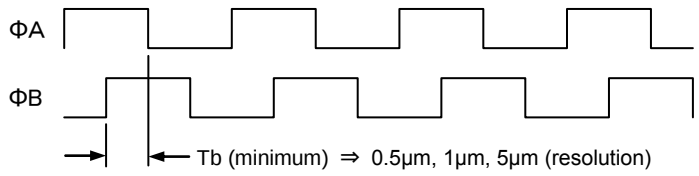
(A) Real-time pulse output (Phase-A wave advances when the spindle is retracted.)



(1) Output condition: Spindle moving speed ≤ 250mm/s *4
(2) Minimum edge-to-edge interval of output pulses: Tr (See the following table.)
(3) Output delay time *5: Max. 1μs

(B) Burst pulse output (Phase-A wave advances when the spindle is retracted.)

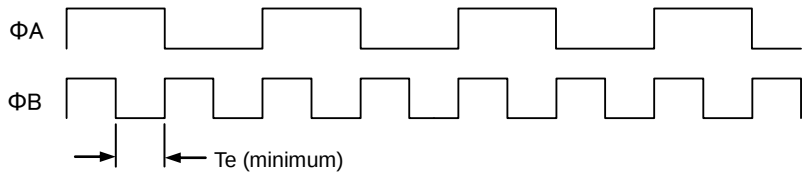
When the response speed reaches the speed limit of real-time pulse output, the linear gage will switch its signal output form to that consisting of burst pulses. At this time, these burst pulses will be such 2-phase square wave signals that are forcibly created from the internal clock so the minimum edge-to-edge interval in their output is smaller than the normal real-time pulse output. The burst pulses will not always be outputted so as to exactly reflect the actual motion and the delay in signals also becomes larger, but the counting values will be still valid as long as this output form continues.



(1) Output condition: 250 mm/s *4 < Spindle moving speed ≤ Gage response speed *6
(2) Minimum edge-to-edge interval of output pulses: Tb (See the following table.)
(3) Output delay time *5: ●When feeding the spindle forward = Max. 5 μs
●When returning the spindle backward = Max. 10 μs

(C) Error output

The pulse generation circuit may sometimes overstep its response limit, if the output wave is subject to extreme disturbance due to vibration or impact in the gage unit, or if the spindle moves faster beyond the output limit of burst pulses. However, at this time, as the linear gage will automatically switch its output signal form from burst pulses to error pulses and also synchronize Phase A and Phase B of the 2-phase square wave signals, the user can make use of this facility for error detection.



(1) Output condition: The gage will be identified as error under the following conditions and produce its output in one of the above described special patterns.
● Gage response speed *6 < Spindle moving speed
● At a disturbance such as noise interference, vibration, etc.
(2) Minimum edge-to-edge interval of output pulses: Te (See the following table.)

Minimum edge-to-edge interval / pulse width under each condition

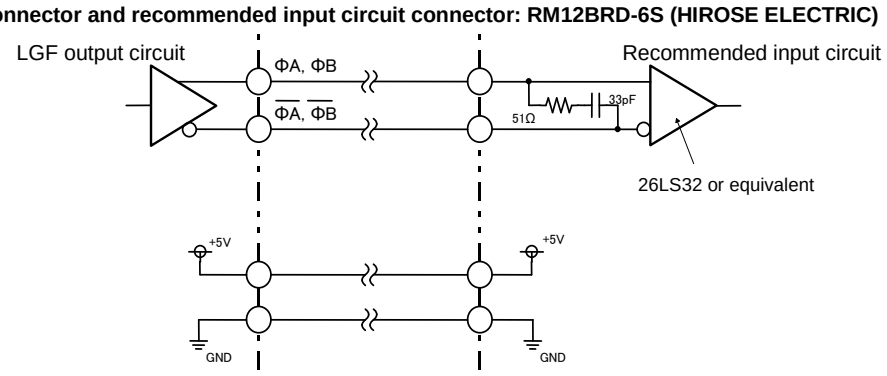
Resolution	Tr (for real-time pulse)	Tb (for burst pulse)	Te (for error pulse)
5μm	1μs	1μs	0.25μs
1μm	1μs	0.5μs	0.25μs
0.5μm	1μs	0.25μs	0.25μs

*4: The actual limit of real-time pulse output will be depreciated to this value. This is because actual detection signals unavoidably contain acceleration components in association with the spindle motion as well as error components from a minute noise included in the signal itself. As a result, some burst pulses at a speed below the ideal conditions (i.e. ideal signal form at constant speed) may be generated.
*5: Output delay time: Time until the counting pulse catches up the spindle position
*6: Gage respond speed: Refer to the section of specifications of the Users Manual.

IMPORTANT

- Since any output during error can not be used as the attribute data, it is necessary to detect the error condition at the reception circuitry side.
- It is recommended to design user circuitry based on an IC chip that is capable of counting at 5 Mcps (equivalent to a square wave of 1.25 MHz) or greater.

5) Input connector and recommended input circuit connector: RM12BRD-6S (HIROSE ELECTRIC)



6) Cable extendible length: The cable can be extended up to 20m using the extension cable (optional).

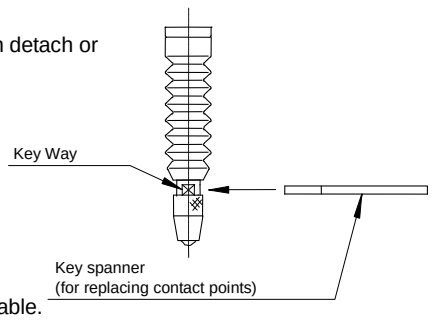
6. Maintenance

1) Replacing the contact point

Fit the supplied key spanner in the keyway of the spindle, then detach or attach the contact point by pinching it with a wrench, etc.

IMPORTANT

If torque is applied to the sensor inside through the spindle, damage or malfunction in the sensor may result. Be sure to fix the spindle using the key spanner.

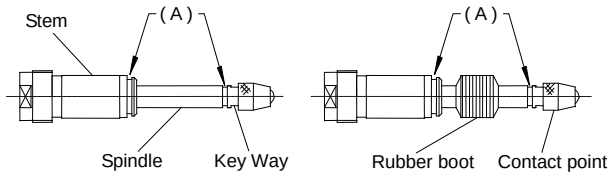


2) Replacing the rubber boot

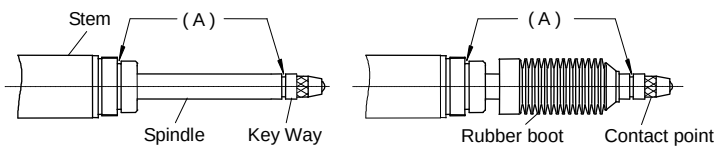
Preventive replacement before being damaged is recommendable. (The rubber boot is available as an optional accessory.)

(1) Remove the old rubber boot, then eliminate the dust and dirt in the grooves (part A) of the stem and spindle.

LGF-0510L-B
LGF-110L-B



LGF-0525L-B
LGF-125L-B
LGF-0550L-B
LGF-150L-B



(2) Insert a rubber boot between the stem and contact point, directing the greater inside diameter end to the stem.
(3) Apply a small amount of silicone adhesive to the grooves (part A), and seal both ends of the rubber boot.

IMPORTANT

If the adhesive is applied to the spindle, the spindle will not slide properly. Great care must be exercised.

7. Specifications

Order NO.	542-161	542-162	542-163
Model No.	LGF - 110L - B	LGF – 125L - B	LGF – 150L - B
Resolution	1μm		
Accuracy (at 20 ℃)	(1.5 + L/50) μm L = Measured length in mm		
Output signal pitch	4μm		
Minimum edge interval	500ns		
Order NO.	542-171	542-172	542-173
Model No.	LGF – 0510 L - B	LGF – 0525L - B	LGF – 0550L - B
Resolution	0.5μm		
Accuracy (at 20 ℃)	(1.5 + L/50) μm L = Measured length in mm		
Output signal pitch	2μm		
Minimum edge interval	250ns		
Order NO.	-	542-612	542-613
Model No.	-	LGF – 0525L - B	LGF – 0550L - B
Resolution	-	5μm	
Accuracy (at 20℃)	-	(7.5 + L/50)μm L = Measured length in mm	
Output signal pitch	-	20μm	
Minimum edge interval	-	1000ns	
Measuring range	10mm	25mm	50mm
Meas. force – Contact point downwards	1.2 N or less	4.6 N or less	5.7 N or less
Meas. force – Contact point horizontal	1.1 N or less	4.3 N or less	5.3 N or less
Meas. force – Contact point upwards	1.0 N or less	4.0 N or less	4.9 N or less
Stem Diameter	Φ8	Φ15	

Specifications common to all series

- Quantizing error: ±1 count ●Positional sensor: Photoelectric transmission linear encoder
- Response speed: 1.5m/s *7
- Output method: 90°phase differential square wave (compatible with RS-422A)
  Refer to the above table for Output Signal pitch and Minimum edge interval
- Contact point: Φ3 carbide ball(Thread: M2.5x0.45) ●Bearing type: Stroke ball bearing
- Protection level: IP66 ●Output cable length: 2m(directly wired from the gage)
- Operating temperature (humidity) :0 to 40 ℃ (20 to 80%RH, with no condensation)
- Storage temperature (humidity) : -10 to 60 ℃ (20 to 80%RH, with no condensation)
- Accessory: No. 538610 Key spanner for contact point replacement (10mm type)
  No. 210187 Key spanner for contact point replacement (25/50mm type)

*7: In the case of 50mm stroke type, an over speed error may occur depending on the spindle retraction amount, if the contact point is released freely after it is retracted.

- CE marking: EMC Directive:EN61326-1
  Immunity test requirements: Clause 6.2 Table2
  Emission limit: Class B

8. Optional Accessories

- Extension cable(5m) : No. 902434
- Extension cable(10m) : No. 902433
- Extension cable(20m) : No. 902432

- Rubber boot (for 10mm type) : No. 238772
- Rubber boot (for 25mm type) : No. 962504
- Rubber boot (for 50mm type) : No. 962505

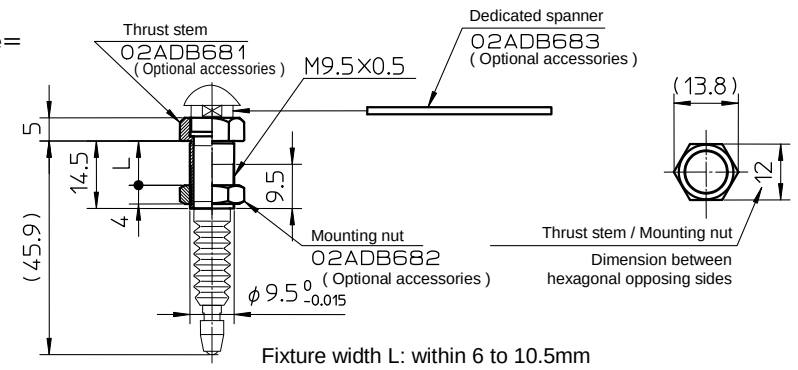
If the thrust stem and tightening nut are used, the gage mount fixture needs only Φ9.5 or Φ18 hole to be drilled, and also the gage can be mounted firmly and easily. (see below.)

- Thrust stem (for 10mm type) :No. 02ADB682 } Thrust stem set (for 10mm type)
- Tightening nut (for 10mm type) :No. 02ADB682 } No.02ADB680
- Dedicated spanner (for 10mm type) : No. 02ADB683

- Thrust stem (for 25/50mm type) :No. 02ADN371 } Thrust stem set (for 25/50mm type)
- Tightening nut (for 25/50mm type) :No. 02ADB692 } No.02ADN370
- Dedicated spanner (for 25/50mm type) :No. 02ADB693

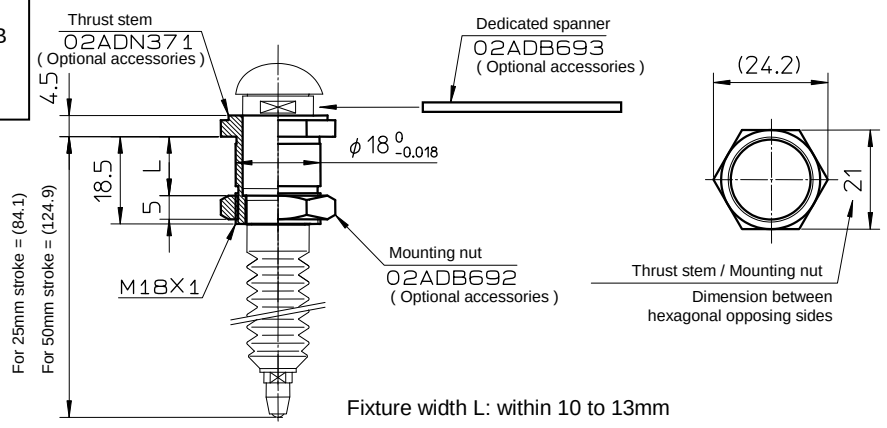
=Example of use=

LGF-0510L-B
LGF-110L-B



Fixture width L: within 6 to 10.5mm

LGF-0525L-B
LGF-125L-B
LGF-525L-B
LGF-0550L-B
LGF-150L-B
LGF-550L-B



Fixture width L: within 10 to 13mm

IMPORTANT

- Before mounting the trust stem, be sure to secure the stem using the dedicated spanner (No.02ADB683/ No.02ADB693). Excessive force applied between the gage body and stem may cause damage to the gage.
- M9 x 0.5/M14 x 0.5 screw are sued only for mounting the trust stem. Do not use them for other purposes.

Mitutoyo

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